

## 4.2 Solving Right Triangle Problems

What do we need trig for?



Ex 1:

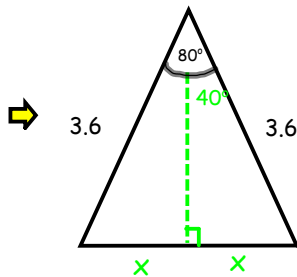
A triangle garden has two equal sides 3.6 m long and the contained angle of  $80^\circ$ .

(note the angle being held between the two given sides is called a contained angle)

a) How much edging is needed for the garden?

b) How much area does this garden cover?

Picture it:



\* Because the triangle is **Isosceles** we know the base angles are equal  
And if we drop a perpendicular from the top it cuts the angle and the base in half \*

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a) Amount of edging - this means I need the \_\_\_\_\_  
~~Solve with SOH CAH TOA~~  
 Lets look at half the triangle

$\sin 40^\circ = \frac{x}{3.6}$  meters

$3.6 \cdot \sin 40^\circ = x$  ~~9p~~  
 $\frac{x}{3.6} \cdot 3.6$   
 $x = 3.6 \sin 40^\circ$   
 $x = 2.31$

$P = 4.62 + 3.6 + 3.6$   
 $P = 11.82$

$\therefore$  the perimeter is 11.82 units

b) Want Area  $A = \frac{bh}{2}$  so I need the base and the height

$\cos 40^\circ = \frac{h}{3.6}$   $A = \frac{bh}{2}$

$3.6 \cdot \cos 40^\circ = \frac{h}{3.6} \cdot 3.6$   
 $h = 3.6 \cos 40^\circ$   
 $h = 2.76$

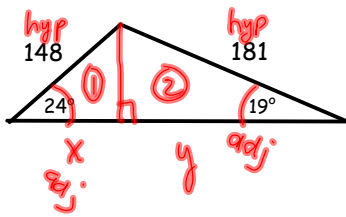
Area:

$A = \frac{4.62 \times 2.76}{2}$   
 $A = 6.38$   
 $\therefore$  the area of the garden is  $6.38 \text{ m}^2$

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Ex 2:

a) How could Steven determine the unknown side of the triangle below?



Not Isosceles so dropping a perpendicular will not cut base in half  
- use two different variables

\* Right now we are only using Primary Ratios,  
later we can use Sin Law\*

b) Find the length of the unknown side.

ΔO

$$\cos 24^\circ = \frac{x}{148}$$

$$x = 135.20$$

ΔE

$$\cos 19^\circ = \frac{y}{181}$$

$$y = 171.13$$

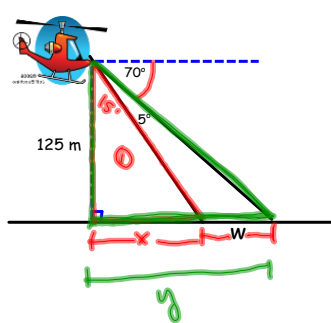
∴ the unknown side is 306.34 units.

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Ex 3:

A searchlight is mounted at the front of a helicopter flying 125 m above ground. The angle of depression the light beam is  $70^\circ$ . An observer on the ground notices that the beam of light measures  $5^\circ$ . How wide is the spot on the ground?

Picture it:

① Δ

$$\tan 15^\circ = \frac{x}{125}$$

$$x = 33.49$$

② Δ

$$\tan 20^\circ = \frac{y}{125}$$

$$y = 45.50$$

$$w = y - x = 45.50 - 33.49 = 12$$

∴ the width of the spot of light is 12 m

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Ex 4

A wheelchair ramp is safe to use if it has a minimum slope of  $\frac{1}{13}$  and a maximum slope of  $\frac{1}{4}$ . What are the minimum and maximum angles of elevation to the top of such a ramp?



$$\tan \theta = \frac{1}{13}$$

$$\theta = \tan^{-1}\left(\frac{1}{13}\right)$$

$$\theta \approx 4^\circ$$



$$\tan \alpha = \frac{1}{4}$$

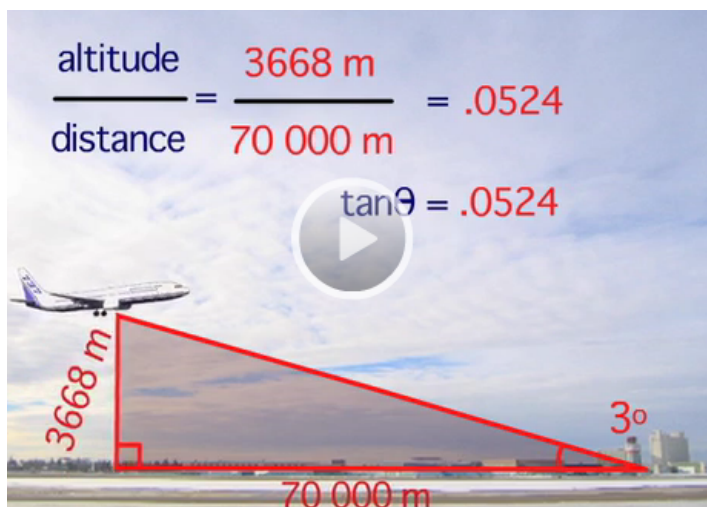
$$\alpha = \tan^{-1}\left(\frac{1}{4}\right)$$

$$\alpha \approx 14^\circ$$

$\therefore$  the min angle is  $4^\circ$   
and the max is  $14^\circ$

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Hmwk: p 280 # 1, 2, 4, 9, 13, 14, 16



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